

A genetic algorithm for optimization of integrated scheduling of cranes, vehicles, and storage platforms at automated container terminals

ABSTRACT

Commonly in container terminals, the containers are stored in yards on top of each other using yard cranes. The split-platform storage/retrieval system (SP-AS/RS) has been invented to store containers more efficiently and to access them more quickly. The integrated scheduling of quay cranes, automated guided vehicles and handling platforms in SP-AS/RS has been formulated and solved using the simulated annealing algorithm in previous literatures. This paper presents a genetic algorithm (GA) to solve this problem more accurately and precisely. The GA includes a new operator to make a random string of tasks observing the precedence relations between the tasks. For evaluating the performance of the GA, 10 small size test cases were solved by using the proposed GA and the results were compared to those from the literature. Results show that the proposed GA is able to find fairly near optimal solutions similar to the existing simulated annealing algorithm. Moreover, it is shown that the proposed GA outperforms the existing algorithm when the number of tasks in the scheduling horizon increases (e.g. 30 to 100).

Keyword: Integrated scheduling; Genetic algorithm; Automated guided vehicles; Quay cranes; Split-platform automated storage/retrieval system